IS 5118 (1969): Constructional Details of Ventilation Trunking for Shipboard Use [TED 17: Shipbuilding]

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(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR CONSTRUCTIONAL DETAILS OF VENTILATION TRUNKING FOR SHIPBOARD USE

(First Reprint SEPTEMBER 1980)

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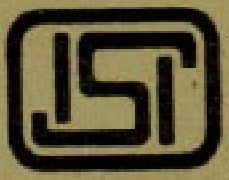

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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SPECIFICATION FOR CONSTRUCTIONAL DETAILS OF VENTILATION TRUNKING FOR SHIPBOARD USE

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Indian Standard

SPECIFICATION FOR CONSTRUCTIONAL DETAILS OF VENTILATION TRUNKING FOR SHIPBOARD USE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 14 April 1969, after the draft finalized by the Shipbuilding Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Trunkings are used on board ships to convey the desired quantities of air to and from the various spaces as required.

0.3 This standard is based on the design practices prevalent in the country's shipyards and assistance has also been derived from ASHRAE Publication 'Heating, Ventilation and Air-conditioning Guide.

0.4 This standard generally incorporates the requirements under the Merchant Shipping Act, 1958 and the rules made thereunder and in addition the installation of marine ventilation and air-conditioning systems on board ships, is subject to the approval of the Government of India, under the said Act and the Rules, where applicable.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

1. SCOPE

1.1 This standard gives the constructional details of trunkings used on board ships.

*Rules for rounding off numerical values (*revised*).

2. CONSTRUCTION

2.1 Generally, on board ships, trunks of rectangular sections are used, considering the easier manufacture and the maximum utilisation of the space available. The ratio of maximum to minimum axes shall be as near to one as possible, and shall not exceed 4.

2.2 Circular sections may be used where space permits the use of the same.

2.3 Trunking runs shall be made up of straight lengths keeping changes of direction and changes of shape to a minimum. Where such changes are necessary they shall be as gradual as other requirements permit.

2.4 The longitudinal joints of the trunkings shall be as shown in Fig. 1.

2.5 Lateral joints of the trunkings shall be as shown in Fig. 2.

2.6 Changes of direction and section cause increased resistance and turbulence, resulting in an increased noise level. Such changes shall be made to a minimum and where unavoidable, they shall be as gradual as possible. Simple bends shall be used and the inside radius of such bends shall not be less than the width of the trunk, in the plane of the bend.

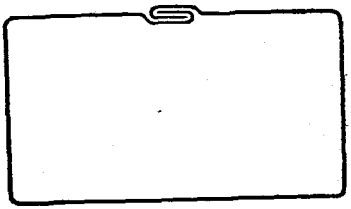
2.6.1 Splitter bends shall be used where space restrictions prohibit the use of simple bends. Splitter bends are recommended for use with trunkings of more than 150 mm width in the plane of the bend. The splitter constrains the air to a more nearly streamline flow around the bend. While fitting splitter bends, the following points shall be considered:

a) Position of splitter,
b) Accurate and secure fitting of splitter,
c) Full coverage of arc of the bend by the splitter, and
d) Doubling over the edges of splitters.

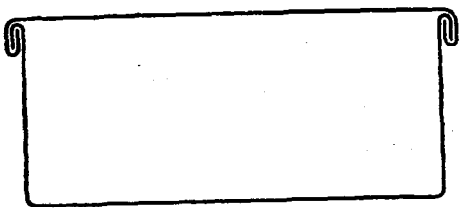
2.6.2 The splitters in bends shall be provided as shown in Fig. 3. The construction of a single splitter bend is shown in Fig. 4.

2.6.2.1 Only one splitter shall be fitted. The internal radius of the bend shall not be less than one-fourth of the width of the trunk, in the plane of the bend and the splitter shall be placed at one-third the duct width from the inner curve.

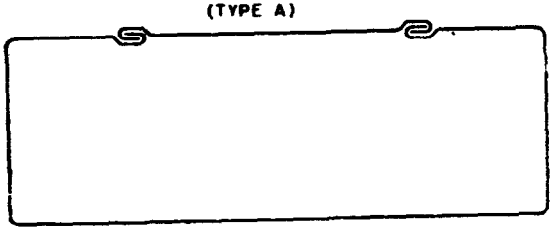
2.6.3 Vaned turns may also be used with large trunkings over 300 mm width to improve air flow around bends. These are sharp turns fitted with guide plates as shown in Table 1 and Fig. 5. Vaned turns shall be fitted to meet special requirements only. Even though the resistance of vaned turns approximate to that of splitter bends, they need greater care in manufacture and maintenance. Vaned turns shall not be fitted unless absolutely unavoidable.



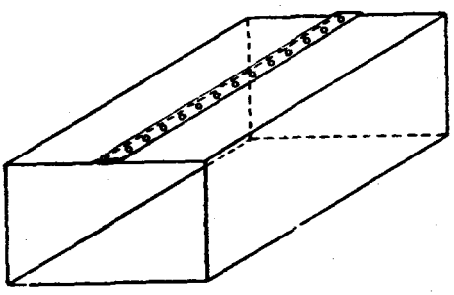
SINGLE LOCK WHEN WIDTH IS NORMAL



DOUBLE LOCK WHEN WIDTH IS ABNORMAL
(TYPE A)

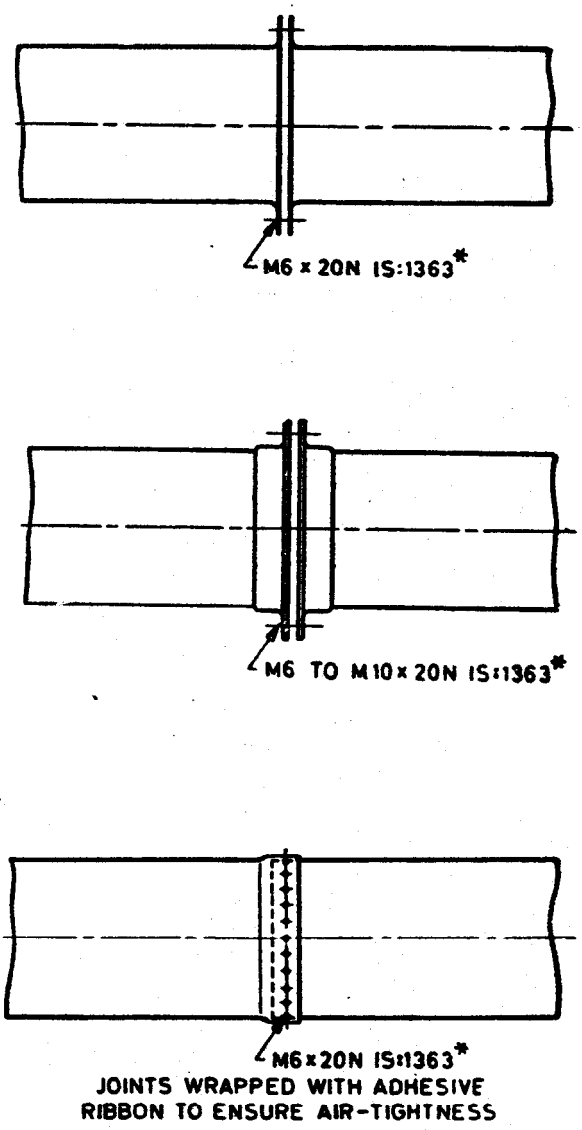


DOUBLE LOCK WHEN WIDTH IS ABNORMAL
(TYPE B)



SPOT WELDED OR RIVETED JOINT WITH SEALING COMPOUND TO ENSURE AIR-TIGHTNESS

FIG. 1 LONGITUDINAL JOINTS FOR DUCTS (FOR MATERIAL THICKNESS UP TO 2 mm)



*Black hexagonal bolts (6 to 39 mm) with nuts and black hexagonal screws (6 to 24 mm).

FIG. 2 LATERAL JOINTS OF TRUNKING

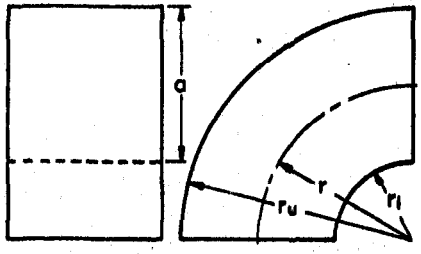
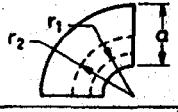
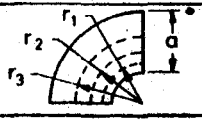
	$r : a$	0·5	0·55	0·75	1·0	1·5	2·0
	$r_u : a$	1·0	1·05	1·25	1·5	2·0	2·5
	$r_l : a$	0	0·05	0·25	0·5	1·0	1·5
 1 SPLITTER	$r_1 : a$	0·2	0·25	0·6	0·85	1·4	1·9
 2 SPLITTERS	$r_1 : a$	0·1	0·15	0·45	0·70	1·25	
	$r_2 : a$	0·3	0·35	0·75	1·0	1·60	
 3 SPLITTERS	$r_1 : a$	0·1	0·15	0·4	0·65		
	$r_2 : a$	0·2	0·25	0·6	0·85		
	$r_3 : a$	0·5	0·55	0·85	1·10		

FIG. 3 SPLITTERS IN BENDS

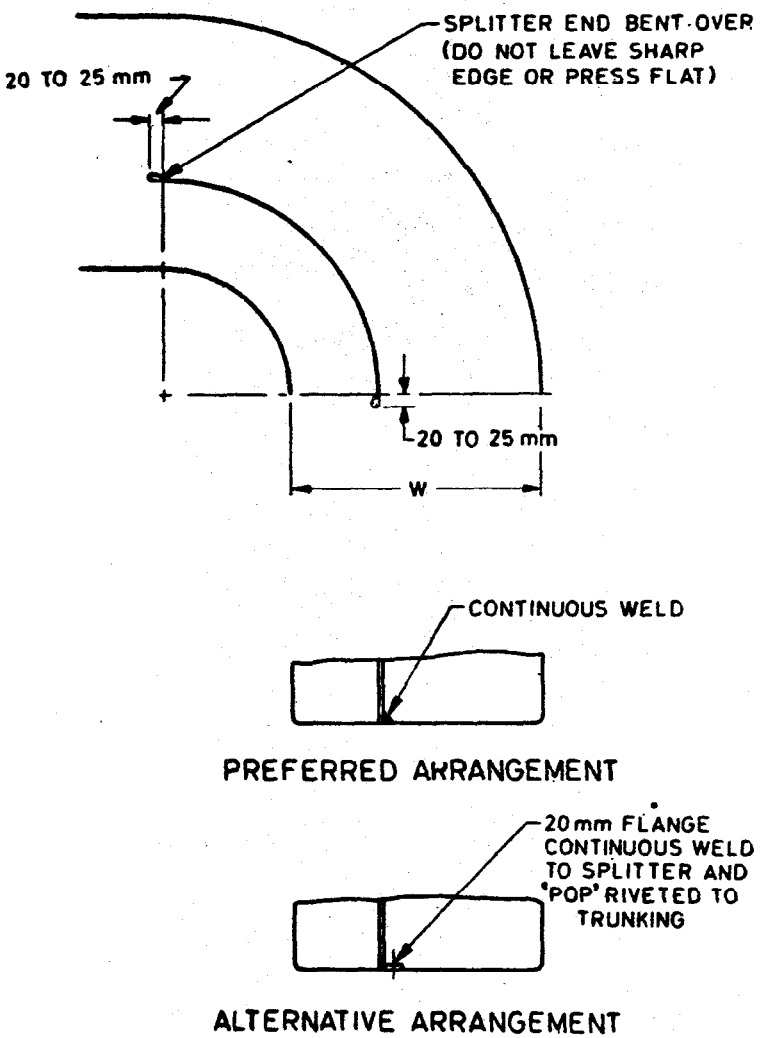
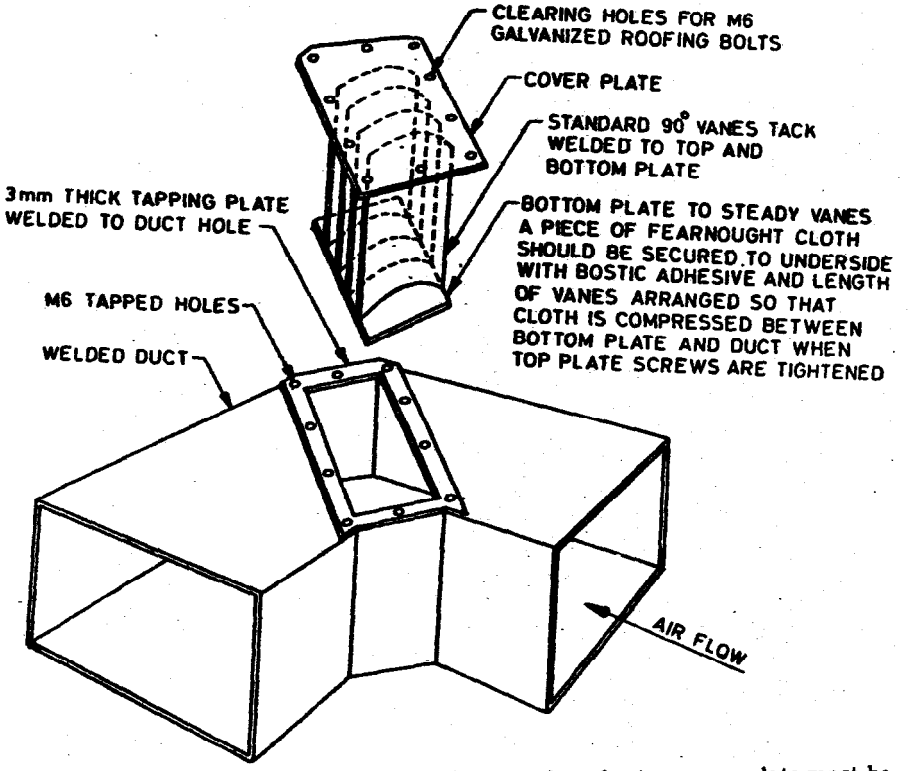


FIG. 4 SINGLE SPLITTER BEND CONSTRUCTION



NOTE 1 — When fitted in watertight trunking the top cover plate must be fitted with a rubber gasket and fastenings suitably spaced.

NOTE 2 — Vaned turn cover plate to be kept clear of obstructions to permit removal for cleaning.

FIG. 5 VANED TURN CONSTRUCTION

2.6.4 The dimensions of 90° vaned turns shall be as shown in Table 1.

2.7 Typical arrangements of branch pipes from the main trunks shall be as shown in Fig. 6 and 7.

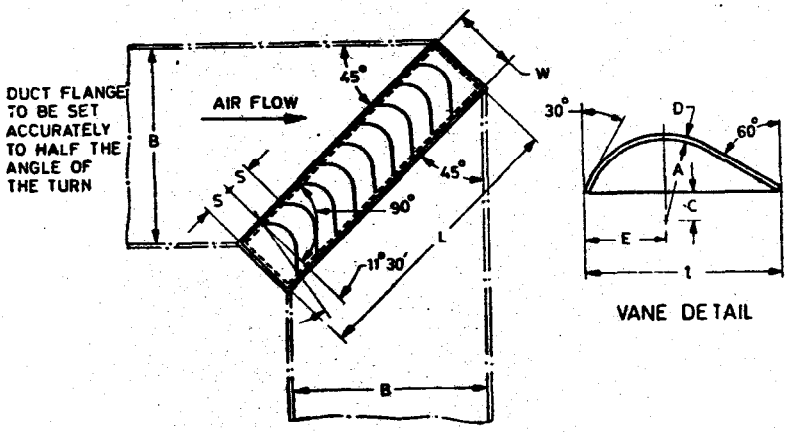
2.7.1 Where necessary, the change of section pieces shall be as shown in Fig. 8.

2.7.2 The supply and exhaust bell-mouth, if used, shall be as shown in Fig. 9.

TABLE 1 DIMENSIONS FOR ASSEMBLING 90° VANED TURN GRIDS

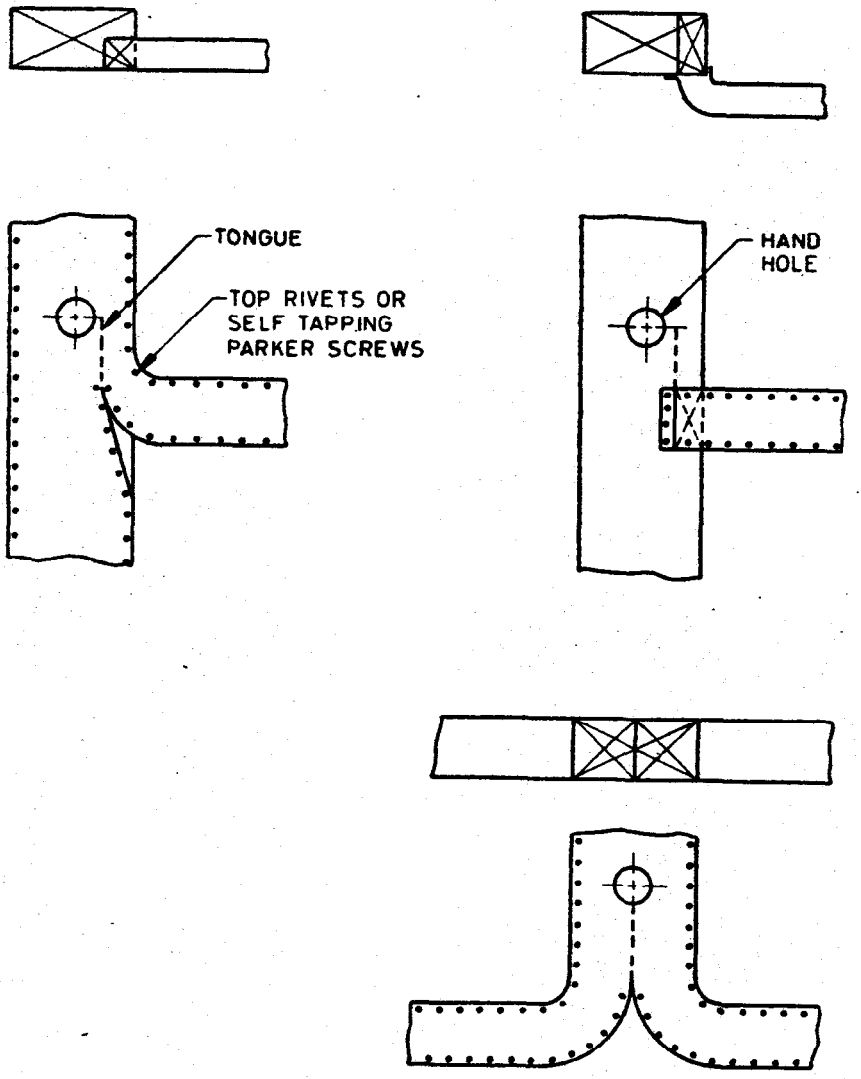
(*Clauses* 2.6.3 *and* 2.6.4)

All dimensions in millimetres.



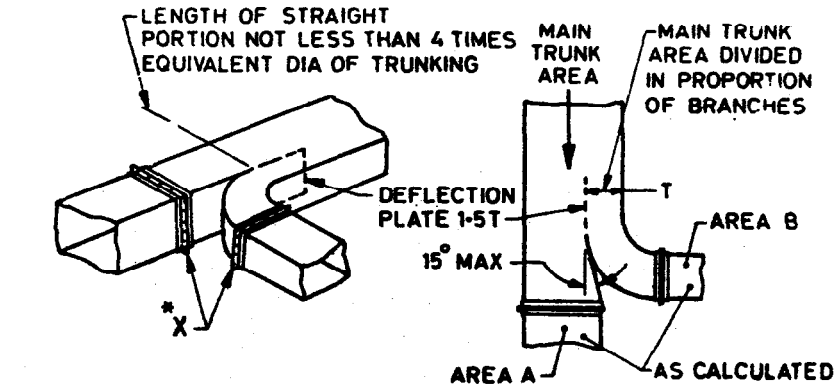
t	*A*	*E*	*C*	*D*
151·61	83·50	61·91	22·22	1·575
76·60	31·75	31·73	11·11	1·575

Width of Trunk *B*	Number of Vanes *N*	Inside Length of Frame *L*	Spacing of Vanes *S*	Width of Channel *W*
(1)	(2)	(3)	(4)	(5)
306·8	10	430·78	38	76
330·2	11	466·85	38	76
355·6	12	502·92	38	76
381·0	13	538·48	38	76
406·4	14	574·06	38	76
431·8	7	610·62	70	152
457·2	8	646·43	70	152
482·6	8	682·50	70	152
508·0	9	718·31	70	152
533·4	9	754·13	70	152
558·8	10	790·19	70	152
584·2	10	826·01	70	152
609·6	11	859·54	70	152
635·0	11	897·89	70	152
660·4	12	933·70	70	152
685·8	12	969·77	70	152
711·2	13	1 005·59	70	152
736·6	14	1 041·65	70	152
762·0	14	1 077·47	70	152
Over 762·0	—	—	70	152

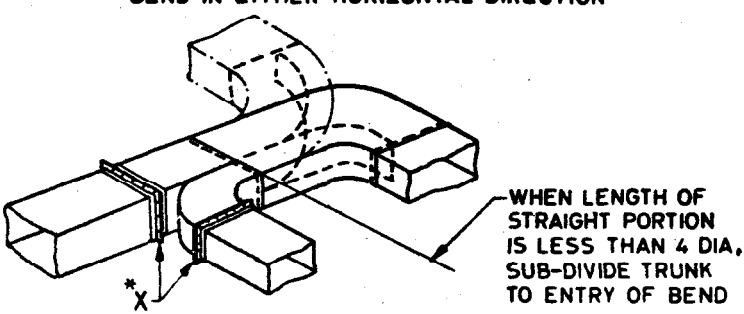


NOTE — As far as possible, branch ducts should be to the full depth of main trunking.

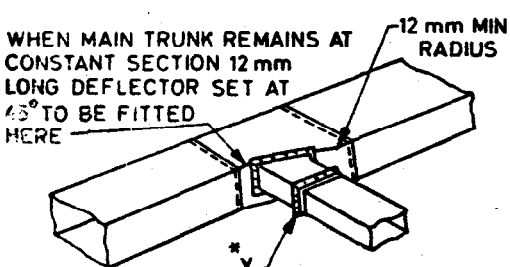
FIG. 6 BRANCH TAKE OFFS (FOR RECTANGULAR MAIN AND BRANCH DUCTS)



BEND IN EITHER HORIZONTAL DIRECTION



CONNECTION WHEN BRANCH TRUNKING IS SMALL IN RELATION TO MAIN TRUNKING

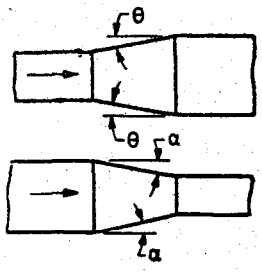


PARTICULARLY APPLICABLE WHEN THE CALCULATED BRANCH DIMENSIONS ARE SMALLER THAN THOSE NECESSARY FOR THE SIZE OF LOUVRE TO BE FITTED

*FLANGE CONNECTIONS FOR ORIFICE PLATE FITTING IF NECESSARY

FIG. 7 BRANCH TAKE OFFS

Type 1



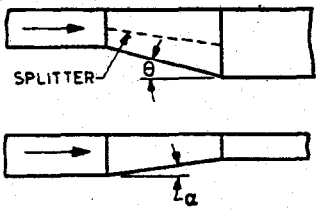
Diverging Sides

θ = Generally 7°. Slope 1 in 8. 15° *Max* slope. 1 in 4 where angles in excess of 15° are unavoidable, equally spaced splitters not more than 15° included angle are to be fitted.

Converging Sides

α = Generally 15°. Slope 1 in 4. 30° *Max* slope. 1 in 2 where angles in excess of 30° are unavoidable, equally spaced splitters not more than 30° included angle are to be fitted.

Tpye 2



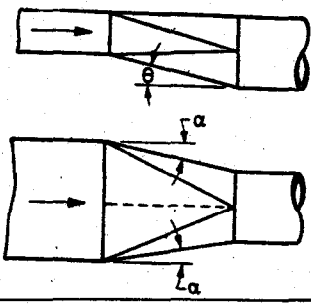
Diverging Side

θ = Generally 7°. Slope 4 in 8. Splitter is to be fitted centre to centre; one additional splitter is required for each 10° increase.

Converging Side

α = Generally 15°. Slope 1 in 4. 30° *Max* slope.

Type 3

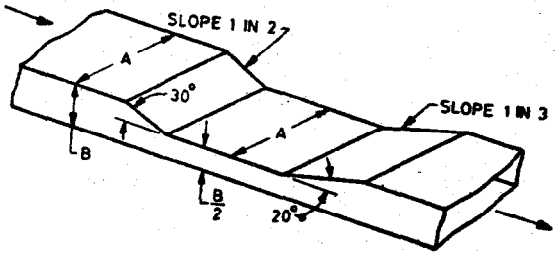


Diverging Side

θ = Generally 7°. Slope 4 in 8. Splitter is to be fitted centre to centre; one additional splitter is required for each 10° increase.

Converging Side

α = Generally 15°. Slope 1 in 4. 30° *Max* slope. 1 in 2 where angles in excess of 30° are unavoidable, equally spaced splitters not more than 30° included angle are to be fitted.

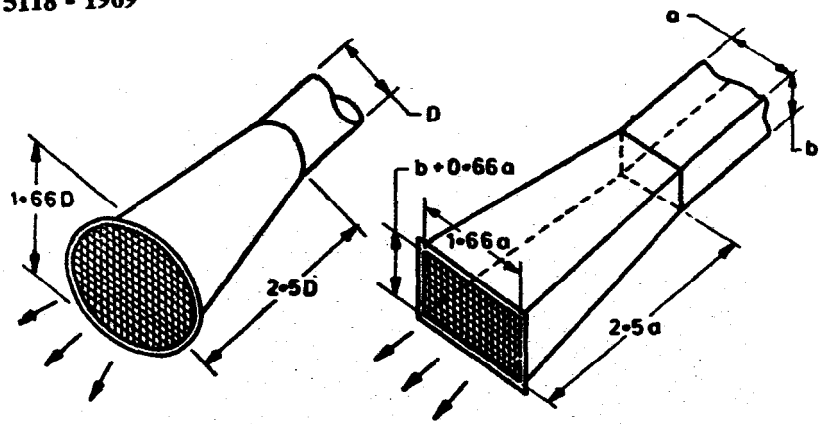


When trunks are required to pass under or through beams. Trunk area is not required to be constant and 90° bends are to be avoided.

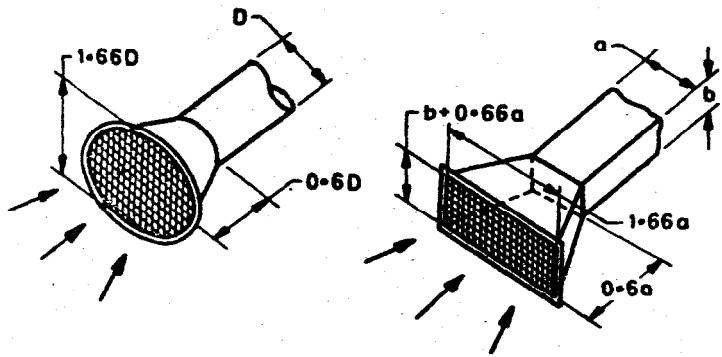
Venturi construction to be used only when it is unavoidable.

VENTURI CONSTRUCTION

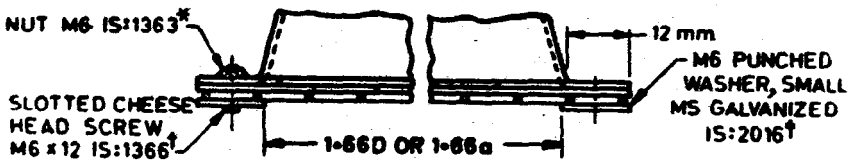
FIG. 8 CHANGE OF SECTION PIECES



SUPPLY BELLMOUTH (SYSTEM OUTLET)



EXHAUST BELLMOUTH (SYSTEM INLET)



CONNECTION OF WIRE MESH TO BELLMOUTH

*Black hexagonal bolts (6 to 39 mm) with nuts and black hexagonal screws (6 to 24 mm).

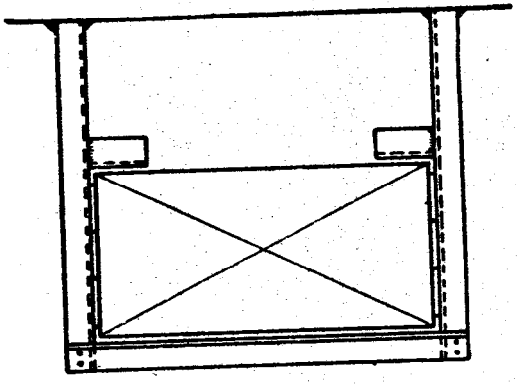
†Slotted round and cheese head machine screws (1·6 to 20 mm).

‡Plain washers (*first revision*).

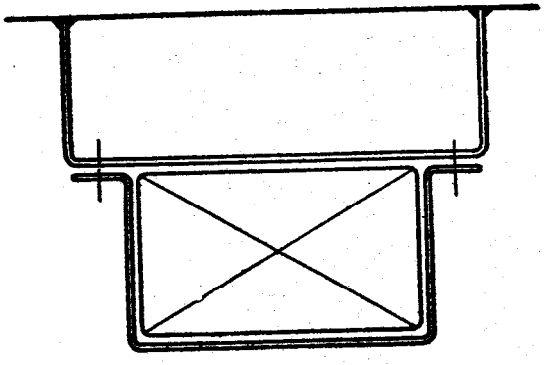
FIG. 9 BELLMOUTH DETAILS

2.8 The trunking shall be properly supported and the arrangement shall be as shown in Fig. 10.

2.8.1 Where trunking is supported by spring hangers, the method of supporting shall be as shown in Fig. 11.

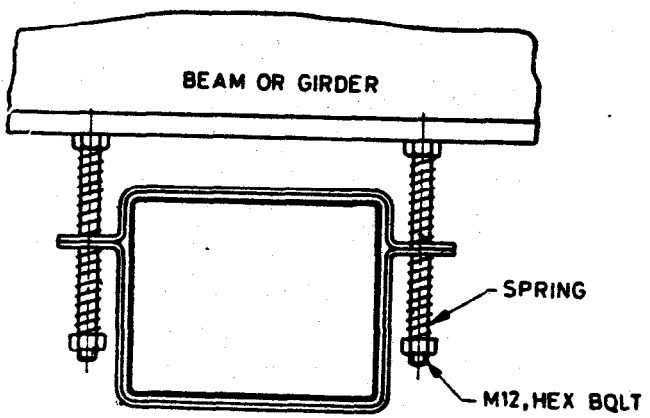


Supported by MS angles of sizes from 25 × 25 × 3 mm to 40 × 40 × 6 mm, depending upon the size of the trunking, for heavy plates in engine room, spacing about 2 m apart.

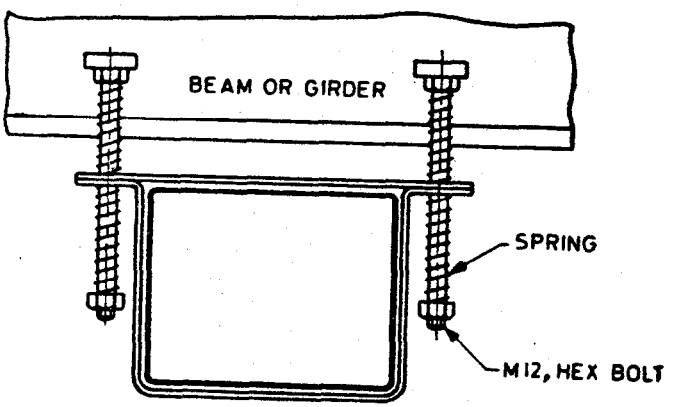


Supported by MS flat bolted with 6 mm dia bolt with nut for trunking in all accommodation spaces. Spacing about 2 m apart.

FIG. 10 SUPPORTING ARRANGEMENT FOR TRUNKING



HANGERS WELDED TO UNDERSIDE OF BEAMS



HANGERS WELDED TO SIDE OF BEAMS

SPRING DETAILS

No. of coils	9
Internal dia	14 mm
Wire dia	3 mm
Length	63 mm
Unloaded stiffness	9·42 kg/cm²

Hangers spaced approx 2 metres apart.

FIG. 11 SPRING HANGER FOR TRUNKING

2.9 The connection between aluminium and steel portions on trunking shall be effected by bolted flanges with galvanized mild steel bolts. The faying surfaces shall be degreased etched and painted with two coats of yellow zinc chromate. Neoprene, compressed asbestos fibre or rubber seal as appropriate shall be inserted between the flanges. In situations where fire risk in normal working use is expected, gaskets likely to be affected by heat shall not be used. Effective separation of aluminium and steel shall be maintained to avoid galvanic corrosion.

2.10 To reduce the possible occurrence of drumming of trunking made of mild steel sheets with widths above 400 mm, additional stiffening of the sides shall be done either by swaging externally in the longitudinal or by introducing external stiffeners.

2.10.1 When the sides of the trunking are made out of mild steel sheets of thickness 3 mm and above and widths over 600 mm, in addition to external stiffening, consideration shall be given to the provision of internal longitudinal sub-division.

2.10.2 The external stiffeners referred to in 2.10.1 are to be made of same gauge sheets as that of the trunk in the form of an angle 25 mm × 25 mm and riveted to the sides longitudinally. The external stiffeners referred to in 2.10.1 shall be made of the same thickness mild steel sheets as that of the trunk in the form of a flat bar of 25 mm wide and welded to the sides longitudinally.

3. CLASSIFICATION

3.1 Trunkings are broadly classified under the following three categories:

a) Trunking that passes through accommodation spaces,

b) Trunking that passes through machinery spaces, and

c) Trunking that passes through cargo hold spaces.

4. MATERIAL

4.1 All mild steel material used for the construction of trunking shall conform to IS : 1570-1961*.

4.2 Galvanizing of steel plates shall be in accordance with IS : 2629-1966†.

*Schedules for wrought steels for general engineering purposes.
†Recommended practice for hot-dip galvanizing of iron and steel.

4.3 Where aluminium sheets are used as an alternative to galvanized sheets, more care shall be taken in fabrication. The aluminium alloy used shall be NS4 — ¼ H or SI C — ¼H conforming to IS : 737-1965*.

5. DIMENSIONS

5.1 The recommended thickness of materials for trunk construction shall be as shown in the following table:

Category	*Size of Trunk*	*Thickness of Sheet Recommended*
1	Up to 300 mm × 300 mm	1 mm GI sheet
	From 300 mm × 300 mm to 500 mm × 500 mm	1·5 mm GI sheet
	Over 500 mm × 500 mm	2 mm GI sheet
2	Up to 500 mm × 500 mm	2 mm GI sheet
	From 500 mm × 500 mm to 750 mm × 750 mm	3 mm MS sheet
	Over 750 mm × 750 mm	4 mm MS sheet
3	Any size	4 mm to 8 mm MS depending upon its location

5.2 Where aluminium alloy is used for the manufacture of trunking, the material shall be two-gauge heavier than corresponding mild steel sheets and shall be reinforced.

6. PAINTING

6.1 The interior surface of all aluminium alloy and galvanized steel trunks shall be smooth and unpainted.

6.2 Where ventilation trunk is built as an integral part of the ships structure, fabricated out of ungalvanized steel plating, the interior surfaces shall be coated with two coats of red lead paint and one coat of aluminium hold paint.

6.3 The outer of surface of ventilation trunk shall be painted with two coats of red lead paint for mild steel, and two coats of zinc chromate primer for GI sheets. Undercoat and finishing coats are same as those of the compartments through which they are passing.

*Wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) (*revised*).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 1 kg.1 m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones : 26 60 21, 27 01 31 **Telegrams : Manaksanstha**

Regional Offices:		Telephone
Western : Novelty Chambers, Grant Road	BOMBAY 400007	37 97 29
Eastern : 5 Chowringhee Approach	CALCUTTA 700072	23-08 02
Southern : C. I. T. Campus, Adyar	MADRAS 600020	41 24 42
Branch Offices:		
'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001	2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002	2 76 49
Gangotri Complex, Bhadbhada Road, T.T. Nagar	BHOPAL 462003	6 27 16
22E Kalpana Area	BHUBANESHWAR 751014	5 36 27
Ahimsa Bldg, SCO 82-83, Sector 17C	CHANDIGARH 160017	2 83 20
5-8-56C L. N. Gupta Marg	HYDERABAD 500001	22 10 83
D-277 Todarmal Marg, Banipark	JAIPUR 302006	6 98 32
117-418 B Sarvodaya Nagar	KANPUR 208005	8 12 72
Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27